



Risk assessment of dengue virus amplification in Europe based on spatio-temporal high resolution climate change projections

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Abstract:

During the last decades dengue incidences are emerging significantly around the globe. Currently, about one fifth of the human population lives in dengue risk zones, which are mainly located in (sub-) tropical regions of Southeast Asia and the Western Pacific. Dengue infections in European population mainly referred to returning travellers from tropical endemic regions. Nevertheless, vector establishment in Europe already took place and therefore the risk increases. Currently, autochthonous cases of dengue fever have been reported in Europe. Studies estimating the risk of dengue epidemics regarding changing climatic conditions in Europe are missing. Therefore, we close this gap by using the temperature constraints for virus amplification within the vector *Aedes aegypti* from two laboratory experiments. We transfer these findings to the changing European climate based on data provided from a regional climate model (COSMO-CLM; A1B and B1 scenario). Daily mean temperature were averaged for the time-steps 2011-2040, 2041-2070 and 2071-2100 in order to reduce natural variability but rather point out climatic trends for risk assessments. For both scenarios the strongest increase of temperature is projected after mid-century. Results indicate a growing threat of virus amplification in Europe especially towards the end of this century. Larger parts of the Mediterranean will be at risk. The southwest of the Iberian Peninsular appears to be especially threatened. Even in some parts of Central Europe, such as Southwest Germany, dengue virus amplification can no longer be excluded at the end of the century. However, it is unlikely that *Aedes aegypti* will serve as an efficient vector in Europe. In fact, it is *Aedes albopictus* that is an invasive species in Europe and potential differences in extrinsic incubation period between *Ae. aegypti* and *Ae. albopictus* have to be identified. Policy and public health authorities have to consider these emerging biorisks in order to establish surveillance systems and develop counteraction strategies. Hence, we strongly emphasize the need for a growing European awareness in the face of biological hazards that are responding to climatic changes.

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Resource Description

Climate Scenario :

specification of climate scenario (set of assumptions about future states related to climate)

Special Report on Emissions Scenarios (SRES), Other Climate Scenario

Special Report on Emissions Scenarios (SRES) Scenario: SRES B1

Other Climate Scenario: SRES A1B

Climate Change and Human Health Literature Portal

Early Warning System:

resource focus on systems used to warn populations of high temperatures, extreme weather, or other elements of climate change to prevent harm to health

A focus of content

Exposure :

weather or climate related pathway by which climate change affects health

Ecosystem Changes, Temperature

Temperature: Fluctuations

Geographic Feature:

resource focuses on specific type of geography

None or Unspecified

Geographic Location:

resource focuses on specific location

Non-United States

Non-United States: Europe

Health Impact:

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Vectorborne Disease

Vectorborne Disease: Mosquito-borne Disease

Mosquito-borne Disease: Dengue

Mitigation/Adaptation:

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology:

type of model used or methodology development is a focus of resource

Exposure Change Prediction

Resource Type:

format or standard characteristic of resource

Research Article

Timescale:

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time period studied

Medium-Term (10-50 years)

Vulnerability/Impact Assessment:

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content